DIFFERENTIATION FORMULAE:

1. $\frac{d}{dx} Constant = 0$
2. $\frac{d}{dx}(x) = 1$
3. $\frac{d}{dx}\sqrt{x} = \frac{1}{2\sqrt{x}}$
4. $\frac{d}{dx}x^n = nx^{n-1}$
5. $\frac{d}{dx}e^x = e^x$
6. $\frac{d}{dx}a^x = a^x \log a$
7. $\frac{d}{dx}\log x = \frac{1}{x}$
8. $\frac{d}{dx}x^x = x^x(1 + \log x)$
9. $\frac{d}{dx}\sin x = \cos x$
10. $\frac{d}{dx}\cos x = -\sin x$
11. $\frac{d}{dx}\tan x = sec^2 x$
12. $\frac{d}{dx}\cot x = -cose^2 x$
13. $\frac{d}{dx}\sec x = \sec x.\tan x$
14. $\frac{d}{dx}\operatorname{cosec} x = -\operatorname{cosec} x.\cot x$
15. $\frac{d}{dx} sin^{-1} x = \frac{1}{\sqrt{1-x^2}}$
16. $\frac{d}{dx} cos^{-1} x = \frac{-1}{\sqrt{1-x^2}}$
17. $\frac{d}{dx} tan^{-1} x = \frac{1}{1+x^2}$
18. $\frac{d}{dx} cot^{-1} x = \frac{-1}{1+x^2}$
19. $\frac{d}{dx} sec^{-1} x = \frac{1}{x\sqrt{x^2-1}}$
20. $\frac{d}{dx} cosec^{-1} x = \frac{-1}{x\sqrt{x^2-1}}$
21. $\frac{d}{dx}\sinh x = \cosh x$
22. $\frac{d}{dx}\cosh x = \sinh x$
23. $\frac{d}{dx}\tanh x = sech^2 x$
24. $\frac{d}{dx}\coth x = -cosech^2 x$
25. $\frac{d}{dx}\operatorname{sech} x = -\operatorname{sech} x.\tanh x$
26. $\frac{d}{dx}\operatorname{cosech} x = -\operatorname{cosech} x.\coth x$
27. $\frac{d}{dx} \sinh^{-1} x = \frac{1}{\sqrt{x^2+1}}$
28. $\frac{d}{dx} cosh^{-1} x = \frac{1}{\sqrt{x^2-1}}$
29. $\frac{d}{dx} tanh^{-1} x = \frac{1}{1-x^2}$
30. $\frac{d}{dx} coth^{-1} x = \frac{1}{1-x^2}$
31. $\frac{d}{dx} sech^{-1} x = \frac{-1}{x\sqrt{1-x^2}}$
32. $\frac{d}{dx} cosech^{-1} x = \frac{-1}{x\sqrt{1+x^2}}$
33. $\frac{d}{dx}(UV) = U'V + UV'$
34. $\frac{d}{dx}\left(\frac{U}{V}\right) = \frac{U'V - UV'}{V^2}$

INTEGRATION FORMULAE:

35. $\int k\,dx = kx$
36. $\int x^n\,dx = \frac{x^{n+1}}{n+1}$
37. $\int \frac{1}{x}\,dx = \log x$
38. $\int e^x\,dx = e^x$
39. $\int xe^x\,dx = e^x(x-1)$
40. $\int a^x\,dx = \frac{a^x}{\log a}$
41. $\int \frac{1}{ax+b}dx = \frac{1}{a}\log(ax+b)$
42. $\int \frac{ax+b}{cx+d}dx = \int\left(\frac{a}{c} - \frac{(ad-bc)}{c(cx+d)}\right)dx$
43. $\int e^x(f(x) + f'(x))dx = e^x f(x)$
44. $\int \sin x\,dx = -\cos x$
45. $\int \cos x\,dx = \sin x$
46. $\int \tan x\,dx = \log|\sec x|$

47. $\int \cot x \, dx = -\log|\text{cosec } x|$

$= log|\sin x|$

48. $\int \sec x \, dx = \log|\sec x + \tan x|$

49. $\int cosec\, x \, dx = -\log|\text{cosec } x + \cot x|$

50. $\int \sec x \tan x \, dx = \text{Sec } x$

51. $\int cosec\, x \cot x \, dx = -\text{cosec } x$

52. $\int Sec^2 x \, dx = \tan x$

53. $\int cosec^2 x \, dx = -\cot x$

54. $\int \sinh x \, dx = \cosh x$

55. $\int \cosh x \, dx = \sinh x$

56. $\int \tanh x dx = \log|\cosh x|$

57. $\int \coth x dx = \log|\sinh x|$

58. $\int sech^2 x \, dx = \tanh x$

59. $\int cosech^2 x \, dx = -\coth x$

60. $\int \text{sech } x \tanh x \, dx = -\text{sech } x$

61. $\int cosech\, x \coth x \, dx = -\text{cosech } x$

62. $\int \frac{f^1(x)}{f(x)} dx = \log|f(x)|$

63. $\int \frac{d}{dx} f(x) dx = f(x)$

64. $\int \frac{f^1(x)}{\sqrt{f(x)}} dx = 2\sqrt{f(x)}$

65. $\int \frac{1}{\sqrt{1-x^2}} dx = sin^{-1}x$

66. $\int \frac{-1}{\sqrt{1-x^2}} dx = cos^{-1}x$

67. $\int \frac{1}{1+x^2} dx = tan^{-1}x$

68. $\int \frac{-1}{1+x^2} dx = cot^{-1}x$

69. $\int \frac{1}{x\sqrt{x^2-1}} dx = \sec^{-1} x$

70. $\int \frac{-1}{x\sqrt{x^2-1}} dx = cosec^{-1}x$

71. $\int \frac{1}{x^2+a^2} dx = \frac{1}{a}\tan^{-1}\frac{x}{a}$

72. $\int \frac{1}{x^2-a^2} dx = \frac{1}{2a}\log\left(\frac{x-a}{x+a}\right)$

73. $\int \frac{1}{a^2-x^2} dx = \frac{1}{2a}\log\left(\frac{a+x}{a-x}\right)$

74. $\int \frac{1}{\sqrt{x^2+a^2}} dx = \sinh^{-1}\frac{x}{a}$

$= \log\left|x + \sqrt{x^2+a^2}\right|$

75. $\int \frac{1}{\sqrt{x^2-a^2}} dx = \cosh^{-1}\frac{x}{a}$

$= \log\left|x + \sqrt{x^2-a^2}\right|$

76. $\int \frac{1}{\sqrt{a^2-x^2}} dx = sin^{-1}\frac{x}{a}$

77. $\int \sqrt{x^2+a^2} dx = \frac{x}{2}\sqrt{x^2+a^2} + \frac{a^2}{2}\sinh^{-1}\frac{x}{a}$

78. $\int \sqrt{x^2-a^2}\, dx = \frac{x}{2}\sqrt{x^2-a^2} - \frac{a^2}{2}\cosh^{-1}\frac{x}{a}$

79. $\int \sqrt{a^2-x^2}\, dx = \frac{x}{2}\sqrt{a^2-x^2} + \frac{a^2}{2}\sin^{-1}\frac{x}{a}$

80. $\int e^{ax}\sin(bx+c) = \frac{e^{ax}}{a^2+b^2}(asinbx - bcosbx)$

81. $\int e^{ax}\cos(bx+c) = \frac{e^{ax}}{a^2+b^2}(acosbx - bsinbx)$

82. $\int \big(f(x)\big)^n f'(x)dx = \frac{(f(x))^{n+1}}{n+1}$

83. $\int uv = u\int v - \int[u' \int v]$

84. $\int uv = uv_1 - u'v_{2+}u''v_3 - u'''v_4 + \cdots$

85. $\int_{-a}^{a} f(x)dx = \begin{cases} 0 \; if \; f(x) is \; odd \\ 2\int_0^a f(x)dx \; if \; f(x) is \; even \end{cases}$

86. $\int_0^{2a} f(x)dx = 2\int_0^a f(x)dx$

$if \; f(2a-x) = f(x)$

87. $\int_0^{\frac{\pi}{2}} sin^m x dx = \int_0^{\frac{\pi}{2}} cos^m x dx =$

$$\begin{cases} \frac{(m-1)(m-3)\ldots.1}{m(m-2)(m-4)\ldots.2} \times 1 \; if \; m \; is \; odd \\ \frac{(m-1)(m-3)\ldots.1}{m(m-2)(m-4)\ldots.2} \times \frac{\pi}{2} \; if \; m \; is \; even \end{cases}$$

88. $\int_0^{\frac{\pi}{2}} sin^m x cos^n x \, dx =$

$$\begin{cases} \frac{[(m-1)(m-3)\ldots.1][(n-1)(n-3)\ldots.1]}{(m+n)(m+n-2)(m+n-4)\ldots\ldots\ldots\ldots.2} \times \frac{\pi}{2} \; if m,n \; both \; even \\ \frac{[(m-1)(m-3)\ldots.1][(n-1)(n-3)\ldots.1]}{(m+n)(m+n-2)(m+n-4)\ldots\ldots\ldots\ldots.2} \times 1 \quad (other \; wise) \end{cases}$$

TRIGONOMETRY FORMULAE:

1. $sin^2 A + cos^2 A = 1$
2. $sec^2 A - tan^2 A = 1$
3. $cosec^2 A - cot^2 A = 1$
4. $sin2A = 2\text{sinA cosA} = \frac{2tanA}{1+tan^2 A}$
5. $cos2A = cos^2\text{A} - \sin^2\text{A}$
   $= 1-2sin^2 A$
   $= 2cos^2 A - 1$
   $= \frac{1-tan^2 A}{1+tan^2 A}$
6. $sin^2 A = \frac{1-cos2A}{2}$
7. $cos^2 A = \frac{1+cos2A}{2}$
8. $tan2A = \frac{2tanA}{1-tan^2 A}$
9. $\text{cot2A} = \frac{cot^2 A-1}{2cotA}$
10. $\sin 3A = 3sinA - 4sin^3 A$
11. $cos3A = 4cos^3 A - 3cosA$
12. $\tan 3A = \frac{3\,tanA-tan^3 A}{1-3tan^2 A}$
13. $\cot 3A = \frac{3cotA-cot^3 A}{1-3cot^2 A}$
14. Sin(A+B)= sinA cosB + cosA sinB
15. Sin(A-B) = sinA cosB –cos A sinB
16. Cos(A+B)= cosA cosB – sinA sinB
17. Cos(A-B) = cosA cosB + sinA sinB
18. tan(A+B) = $\frac{tanA+tanB}{1-tanAtanB}$
19. tan(A-B) = $\frac{tanA-tanB}{1+tanAtanB}$
20. Cot(A+B) = $\frac{cotA.coB-1}{cotB+cotA}$
21. *Cot(A-B)* = $\frac{cotA.cotB+1}{cotB-cotA}$
22. Sin(A+B) + sin(A-B) = 2sinA cosB
23. Sin(A+B) - sin(A-B)= 2cosA sinB
24. COS(A+B) + cos(A-B) =2cosA cosB
25. Cos(A-B)- cos(A+B)= 2sinA sinB
26. Sin(A+B) sin(A-B)= $sin^2 A - sin^2 B$
    $= cos^2 B - cos^2 A$
27. Cos(A+B) cos(A-B)= $cos^2 A - sin^2 B$
    $= cos^2 B - sin^2 A$
28. Tan (A+B) Tan(A-B) = $\frac{tan^2 A-tan^2 B}{1-tan^2 Atan^2 B}$
29. Cot(A+B) Cot(A-B)= $\frac{cot^2 A.cot^2 B-1}{cot^2 B-cot^2 A}$
30. SinC+ Sin D = $2\sin\frac{C+D}{2}\cos\frac{C-D}{2}$
31. Sinc -sin D = $2\cos\frac{C+D}{2}\sin\frac{C-D}{2}$
32. CosC+ cosD = $2\cos\frac{C+D}{2}\cos\frac{C-D}{2}$
33. CosC – cosD = $2\sin\frac{C+D}{2}\sin\frac{D-C}{2}$
34. $\sinh x = \frac{e^x-e^{-x}}{2}$
35. $\cosh x = \frac{e^x+e^{-x}}{2}$
36. $\tanh x = \frac{e^x-e^{-x}}{e^x+e^{-x}}$
37. $\log ab = \log a + \log b$
38. $\log\frac{a}{b} = \log\text{a} - \log\text{b}$
39. $\frac{\log\text{a}}{\log\text{b}} = \log_{\text{b}}\text{a}$
40. $(1-x)^{-1} = 1 + \text{x} + \text{x}^2 + \text{x}^3$+----------
41. $(1+x)^{-1} = 1 - \text{x} + \text{x}^2 - \text{x}^3$+----------
42. $(1-x)^{-2} = 1 + 2\text{x} + 3\text{x}^2 + 4\text{x}^3$+--------
43. $(1+x)^{-2} = 1 - 2\text{x} + 3\text{x}^2 - 4\text{x}^3$+--------